

Analysis of Trespasser Accidents

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Trespasser accidents represent a major proportion of deaths and injuries on New Zealand's railway corridor. This report looks at the trends in trespasser accidents in the past decade to guide strategies for reducing their incidence. The report begins with an analysis of the Land Transport Safety Authority (LTSA) database, followed by an analysis of the Coroners database.

The report concludes with some findings from Jo Conroy's report on trespassers for the rail safety section of the Land Transport Safety Authority (Conroy, 2004). This report provided details of a Tranz Metro survey of trespassers, international trends on trespassing and some countermeasures used in New Zealand to reduce trespassing.

LTSA Database

Incidence

The number of railway trespassers killed or seriously injured has remained reasonably constant since 1994 with between 10 and 20 trespassers killed per year (see Table 1). In comparison the number of reported non-injury incidents increased substantially in 2003. This is likely to be due to an increase in reporting rates rather than an actual rise in incidents. Due to the influence of reporting rates non-injury incidents will be analysed separately from injury incidents in the following sections.

Table 1. Number of Trespasser Incidents by Injury Severity and Year

	Fatal	Injury	Non-Injury	Total
1994	8	7	48	63
1995	10	5	25	40
1996	5	9	33	47
1997	19	8	20	47
1998	14	5	23	42
1999	14	5	30	49
2000	17	2	16	35
2001	11	2	39	52
2002	10	7	29	46
2003	15	8	92	115
Total	123	58	355	536

Note. Two of the fatalities and one of the injuries were motorcyclists, and one of the injuries was a cyclist, the remainder were pedestrians.

Trespassers Killed and Injured

Day of Week

The majority of trespasser injuries occur between Wednesday and Saturday (see Figure 1).

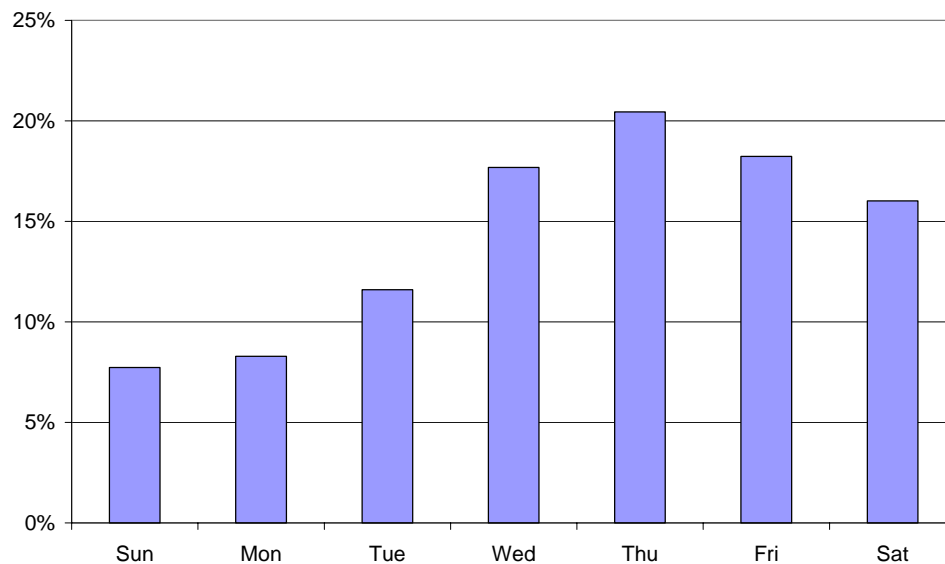


Figure 1 . Percentage of trespassers killed and seriously injured by day of week, 1994-2003.

Month of Year

December has the most trespasser injuries of all the months and June has the least (see Figure 2).

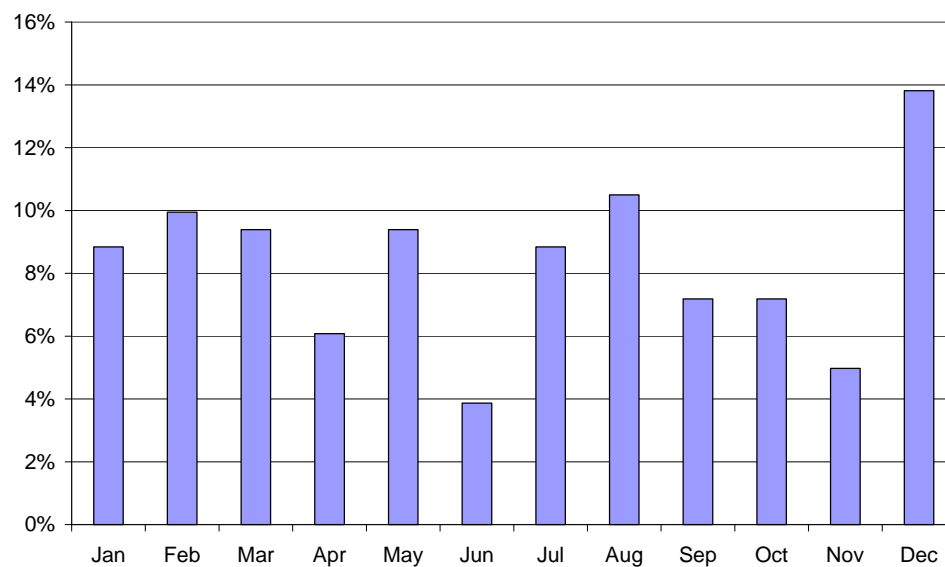


Figure 2. Percentage of trespassers killed and seriously injured by month, 1994-2003

Time of Day

The time that trespassers are killed or injured is reasonably evenly spread across the day (see Figure 3).

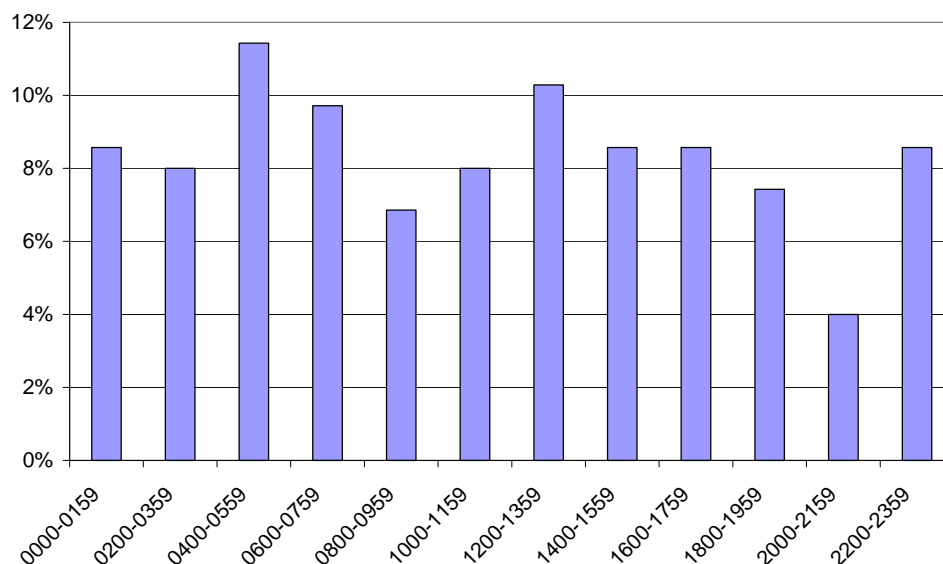


Figure 3. Percentage of killed and injured trespassers by time of accident, 1994-2003

Most trespassers are killed or injured during the day with Thursday being the peak time, followed closely by Friday night/Saturday morning (see Table 2).

Table 2. Time of day and day of week when trespassers are killed and seriously injured, 1994-2003

Day of Week	Day (0600-1759)	Evening (1800-2159)	Night (2200-0559)
Monday	11	2	5
Tuesday	11	3	9
Wednesday	19	4	8
Thursday	22	3	17
Friday	13	4	19
Saturday	7	2	6
Sunday	8	0	2
Total	91	18	66

Note: On the day shown night begins at 2200 and finishes the following day at 0559.

Cause

The LTSA database contains a description of the accident. This is usually limited to train (number) struck and killed trespasser. Some cases do contain some information on how the trespasser was on the track (e.g. lying, walking or crossing). In most of the cases between 1997 and 2003 it appears that the trespasser was lying on the track, suggesting that the trespasser was committing suicide or had fallen asleep on the track.

Location

The LTSA database contains details of the accident location. This was not able to be analysed in time for this report. Data from Europe suggests that there is a greater concentration of suicides around mental institutions (Bob Gibson, personal communication). It would be interesting to investigate whether this is the case in New Zealand to allow appropriate interventions to be developed.

Non-Injury Incidents

Day of Week

The majority of non-injury trespasser incidents occur between Tuesday and Friday (see Figure 4).

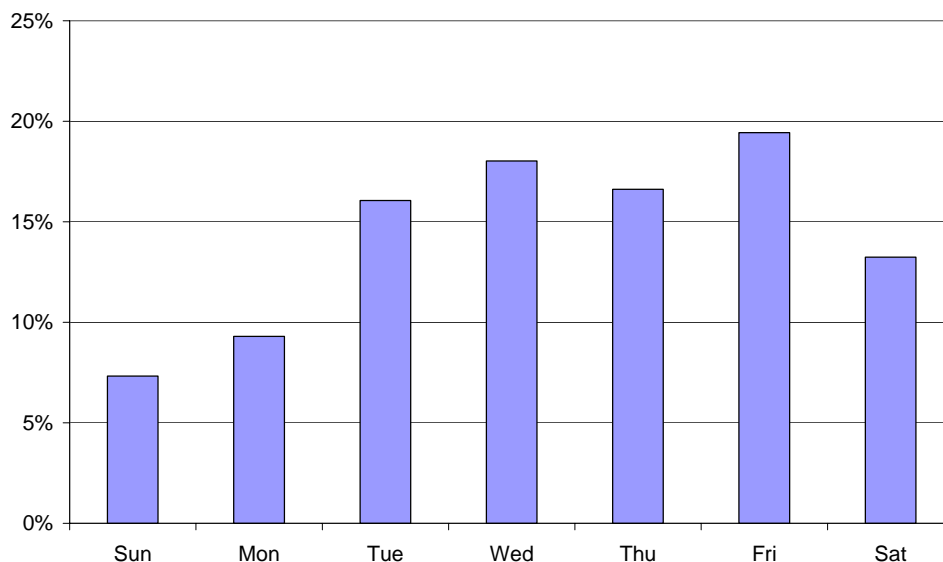


Figure 4. Percentage of Trespasser Non-Injury Incidents by Day of Week, 1994-2003

Month of Year

The summer months of February and March are the most common for non-injury trespasser incidents, with the least common occurring during the winter month of June (see Figure 5).

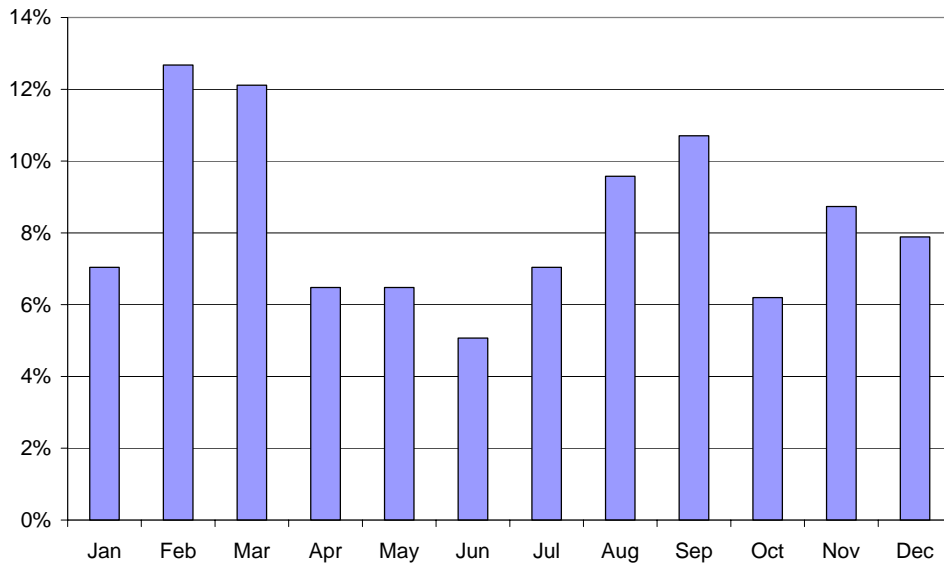


Figure 5. Percentage of Non-Injury Trespasser Incidents by Month, 1994-2003

Time of Day

Almost a third of non-injury trespasser incidents occur between the hours of 1400 and 1800 (see Figure 6). This suggests that children may be involved in trespasser incidents after school, although further work is required.

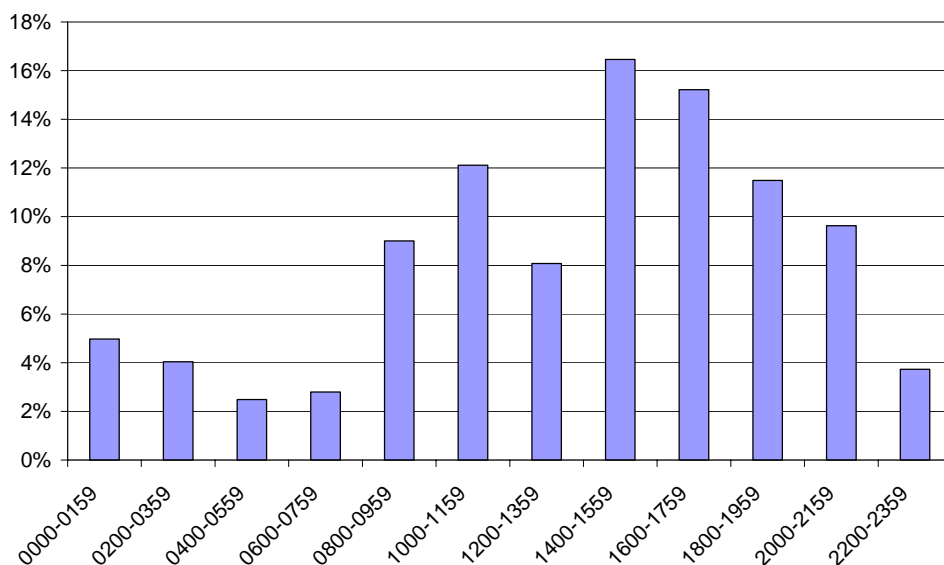


Figure 6. Percentage of Non-Injury Trespasser Incidents by Time of Day, 1994-2003

Nearly two-thirds of trespasser non-injury incidents occur during the day (see Table 3). Most of these incidents occur between Tuesday and Friday.

Table 3. Time of day and day of week when trespasser non-injury incidents occur, 1994-2003.

Day of Week	Day (0600-1759)	Evening (1800-2159)	Night (2200-0559)
Monday	20	7	2
Tuesday	40	9	5
Wednesday	38	17	3
Thursday	37	15	13
Friday	33	16	18
Saturday	22	1	7
Sunday	15	3	1
Total	205	68	49

Note: On the day shown night begins at 2200 and finishes the following day at 0559.

Location

The location of non-injury incidents was not able to be investigated in time for this report. However it would be useful in the future to investigate whether there is any relationship between the location of non-injury incidents and injury accidents.

Coroners Database

To obtain more detailed information about trespasser accidents the Coroners reports were accessed. Since 1999 some information from the Coroners reports have been placed on a database. A query from 1999 to 2003 found 53 incidences of a person being killed by being struck by a train (see Table 4). The majority of these cases were in the LTSA database, although five were in the Coroners database and not in the LTSA database.

There were also 20 cases in the LTSA database that were not identified in the Coroners database. This is likely to be because the Coroners database does not specifically contain a variable "trespasser killed on railway line". The 53 incidences were identified by searching for records that contained the words "person struck by" and then limited manually to only those struck by a train.

The Coroners database contained the variables age, gender and ethnicity which are analysed below. To obtain more information a sample of the Coroners reports were read. The sample consisted of 38 reports with all of the 2002 and 2003 reports read and some of the 1999 to 2001 reports read. The choice of which reports to read depended on the accessibility of the report at the Coroners office, since the reports are spread over different locations at the office. The sample provided information on the contributing factors to the accidents and the trespassers blood alcohol concentration.

Table 4. Number of Trespassers Killed that were Identified in the Coroners Database by Year

Year	Coroners database	In both Coroners & LTSAs database	Number of Reports Read
1999	7	7	6
2000	16	15	6
2001	11	9	7
2002	10	9	10
2003	9	7	9
Total	53	47	38

Age

Almost half of the trespassers killed between 1999 and 2003 that were identified in the Coroners files were aged between 21 and 40 years (see Figure 7). There was also a large percentage aged between 11 and 20 years.

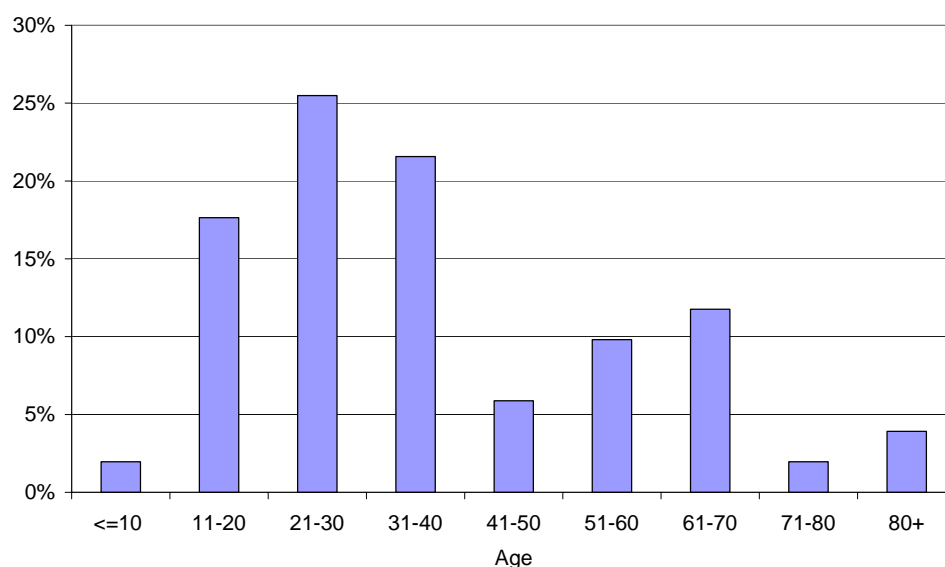


Figure 7. Percentage of trespasser fatalities by age from coroners files, 1999-2003

Gender

Forty-three of the trespassers killed were male. This represents almost 80% of all trespassers killed.

Ethnicity

Just over half of the trespassers killed were Caucasian (see Figure 8). There tends to be an over-representation of Maori trespassers killed, with 28% killed compared to 14% in the population (2001 census data).

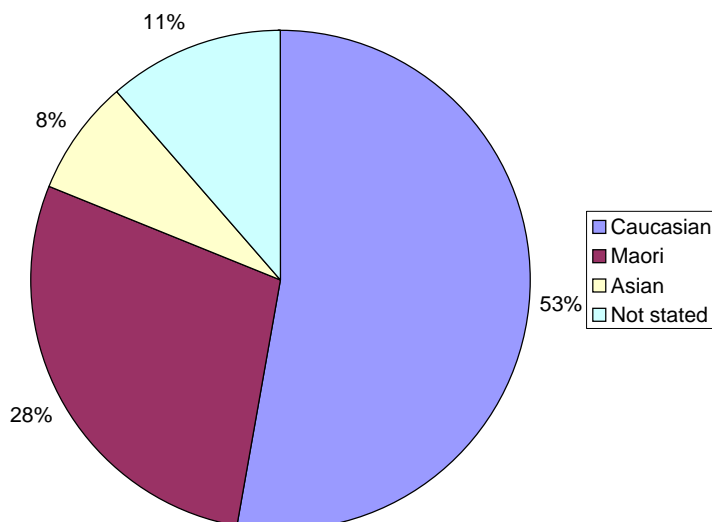


Figure 8. Ethnicity of trespassers killed from Coroners data, 1999-2003

Contributing Factors

The sample of 38 Coroners reports were read to identify which factors were likely to have contributed to the accident. The analysis revealed that the biggest contributing factor to trespasser fatalities was alcohol, followed closely by suicide¹ (see Table 5). Seven of the accidents where suicide was a factor also involved alcohol, thus it is difficult to separate out the main cause. For example the trespasser may have decided to commit suicide before drinking. Alternatively the trespasser may have decided to commit suicide after becoming intoxicated.

Trespassers lying or sitting on the track were either intoxicated or committing suicide. Some of the trespassers killed while walking on the track or crossing the track were intoxicated and on their way home from a social evening. Others were sober but taking a shortcut (e.g. through a railway tunnel). Being hearing impaired was also associated with these accidents.

Three trespassers had cannabis in their system but in all cases they also had alcohol to a high level. Thus the combination may have contributed to the accident.

¹ In some cases suicide was identified as a factor even though the Coroner had not determined this as the cause of death. This was only in cases where it appeared to be very likely to be suicide but the Coroner appeared reluctant to name suicide as the cause of death.

Table 5. Contributing factors associated with trespasser fatalities from Coroner's reports, 1999-2003

Cause	Number
Alcohol	20
Suicide	17
Lying/sitting on track	7
Walking on track	6
Crossing track	3
Jumped in front of train	3
Hearing impaired	3
Cannabis	3
Working near track	2
Fall from platform	2
Inattentive	1
Playing chicken	1

Note: One accident can have more than one contributing factor.

Blood Alcohol Concentration

Half of the trespassers killed had a Blood Alcohol Concentration (BAC) above zero, with another 8% suspected of having a BAC greater than zero (see Table 6). Almost a quarter of the trespassers had a BAC greater than 200 mg/100ml.

Table 6. BAC of trespassers killed or injured from Coroners Reports, 1999-2003

BAC (mg/100ml)	Number
0	5
1-50	2
51-100	3
101-150	1
151-200	4
201-250	4
251-300	3
301+	2
Not assessed, but suspected	3
Not assessed and not suspected	11
Total	38

Tranz Metro Study

Tranz Metro, Wellington conducted a study in which pedestrians were observed at train stations around the Wellington metropolitan area (Conroy, 2004). The study found trespassing was at its worst during the peak times between 7am and 9am in the morning, and 3pm and 6pm in the evening, with

people moving to and from work and school. A large proportion of the trespassing occurred when people were in a hurry or took the 'quicker' route across the tracks rather than using the overbridge or underpass provided.

International Statistics

Trespassers represent a large proportion of fatalities on the rail network in Australia, Canada, the United States and the United Kingdom (Conroy, 2004). Typically these countries have attempted to reduce the trespasser problem by education. For example, Operation Lifesaver in the United States, which educates about the dangers of trespassing, has been associated with a reduction in trespass fatalities of 13% between 1997 and 2000.

In the United Kingdom enforcement has also been used as a method to reduce trespassers.

Resources in New Zealand

Conroy (2004) identified two countermeasures used in New Zealand to reduce trespasser incidents. These are detailed below.

Tracks are for Trains

In August 2003 Tranz Rail launched the 'Tracks are for Trains' initiative, aimed at educating young New Zealanders about safe behaviour near trains and railway tracks. It is an educational resource, which has been developed by Tranz Rail in line with the Health and Physical Education modules in the New Zealand Curriculum and is targeted at 8-11 year olds.

The key messages of the programme are:

- Tracks are for trains
- Trains are quiet, heavy and take a long time to stop
- When near the railway line – be aware and practice RailSafe behaviour

Auckland University Railway pedestrian crossing safety intervention

During an eight-month period from February to September 2000 Auckland University evaluated a programme of interventions designed to reduce the incidence of illegal and unsafe crossings of a rail corridor at a city station by boys on their way to and from the adjacent high school (Lobb et al, 2003; cited in Conroy, 2004). The evaluation included observations of the boys before, during and after the implementation of each intervention and evaluated attitudinal surveys carried out before and after the programme.

A survey prior to the programme indicated that the majority of respondents did not know if it was illegal to cross outside the paved area. The two main reasons for unsafe crossing behaviour were convenience and to save time.

The four key interventions of the programme were:

1. Communications/public awareness – a large billboard was placed near the platforms, picturing a school boy portrayed as thinking about crossing unsafely with the accompanying words “This train of thought could kill you”. Leaflets and posters with a similar message were distributed around the school.
2. Education – six months after intervention 1 Tranz Rail and Auckland City Council personnel spoke to students about rail safety. This was followed by activities during class time over a four week period.
3. Continuous punishment and intermittent reinforcement – 11 weeks after intervention 2 pupils were instructed about safe and unsafe crossing behaviour and warned that from the following week boys observed crossing unsafely by the teacher on duty would be given a Friday detention. Then for a two week period every boy observed crossing unsafely was given a Friday detention. Those observed crossing safely were intermittently given a reward (pens and chocolate bars) by the Auckland City Council.
4. Intermittent punishment and intermittent reinforcement – following intervention 3, for four weeks boys observed crossing unsafely by the teacher on duty during just one period per week were given a Friday detention. The periods selected were variable and unpredictable (a teacher was on duty everyday, not just on the treatment days). During the same period rewards were given out intermittently to boys observed crossing safely

Lobb et al found that all the interventions in the programme contributed to a statistically significant decrease in unsafe crossings compared to prior to the intervention. Intermittent and continuous punishment interventions were the most successful.

Conclusions

The main findings from the analysis are outlined below:

Trespassers Killed and Injured

- The number of railway trespassers killed or seriously injured has remained reasonably constant since 1997 with between 10 and 20 trespassers killed per year.
- Trespassers are most likely to be killed or injured:
 - between Wednesday and Saturday
 - in December
 - during the day
 - on a Thursday or Friday night/Saturday morning
- A number of trespassers killed or injured were lying on the track at the time of the collision, suggesting suicide or that they were intoxicated.

Non-Injury Trespasser Incidents

- Non-injury trespasser incidents are most likely to occur:

- between Tuesday and Friday
- during the summer months of February and March
- between the hours of 1400 and 1800
- between Tuesday and Friday.

Coroners Reports

- Trespassers who are killed are most likely to be:
 - Aged between 21 and 40 years.
 - Male
 - Caucasian (although Maori are over-represented)
 - Intoxicated
- Suicide is one of the main reasons for trespassers being killed.

Data

There is limited information available on trespasser accidents in the LTSA database. This makes it difficult to develop countermeasures. In comparison the Coroners records contain a thorough review of the accident. Therefore to assist the development of strategies it would be useful to regularly review the Coroners records and add the findings to the LTSA database.

There were cases identified in the Coroners database that could not be identified in the LTSA database. In some situations this was due to errors in the LTSA database regarding the date of the accident. Therefore it is important to regularly conduct checks of the accuracy of the data entered into the LTSA database as well as compare the LTSA database with Coroners records.

Tranz Metro Study

In Wellington trespassing has been found to be at its worst during the peak times between 7am and 9am in the morning, and 3pm and 6pm in the evening, with people moving to and from work and school. Convenience and time were major reasons for trespassing.

New Zealand Resources

A 'Tracks are for Trains' initiative developed by Tranz Rail aims to educate young New Zealanders about safe behaviour near trains and railway tracks. A study in Auckland found that an educational campaign accompanied by intermittent punishment and reward was associated with a reduction in trespassing incidents.

General conclusions

Overall trespasser incidents, particularly injury incidents, tend to occur during the summer months in the later part of the week. Although a number of incidents occur during the day there is a high number on Friday

night/Saturday morning. There is also a number of cases involving lying on the track.

The analysis of the Coroners records indicated that those killed tend to be under 40 years of age, male and Caucasian, although Maori are over-represented. They also tend to be intoxicated and/or committing suicide.

There is also a number of incidences of trespassers crossing tracks for convenience or to save time. These incidences have the potential for serious injury and thus should be discouraged. An Auckland study indicated that providing education alongside punishment and reward can be an effective measure for reducing trespassing.

Together these findings indicate that the main trespasser problems are either those committing suicide, people who walk home intoxicated after a social evening via the railway tracks or people crossing the tracks for convenience and to save time. The most effective measure for reducing these behaviours is to completely restrict access to the railway tracks throughout New Zealand. This is a very expensive option for New Zealand, which has over 4,716 km of railroads, and may be subject to vandalism. Thus other measures are needed, such as an education campaign backed up by enforcement in problem areas. This is unlikely to reduce suicide incidences but may help reduce incidences of intoxicated pedestrians walking home via the railway tracks and people crossing the track for convenience.

Recommendations

1. Investigate the location of injury accidents and their proximity to mental institutions.
2. Investigate whether there are similarities in the location of injury accidents versus non-injury incidents.
3. Regularly review the Coroners reports on trespasser fatalities and add the information to the LTSA database.
4. Regularly check the accuracy of the data entered into the LTSA database.
5. Investigate whether it is possible to enhance/expand the amount of information the LTSA collects for its database, including the age of trespassers.
6. Conduct trespasser education and enforcement campaigns in problem areas.
7. Continue to monitor the international literature on measures to reduce trespasser accidents.

References

Conroy, J. (2004). Trespass and vandalism on the railway. Paper for the Rail Safety Section, Land Transport Safety Authority of New Zealand.